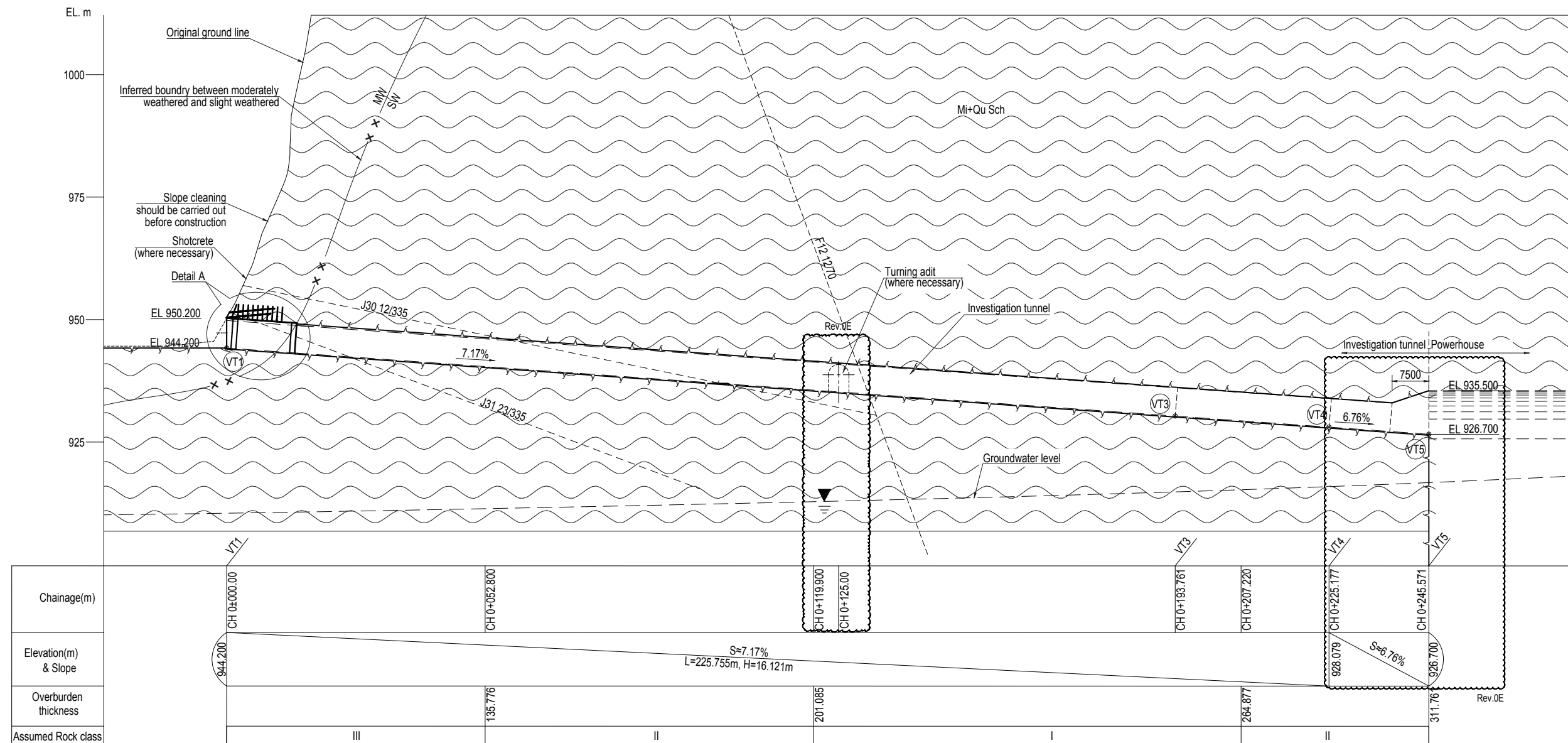


LONGITUDINAL PROFILE OF INVESTIGATION TUNNEL FOR P/H

1:500



NOTE

1. This set of drawings are for the layout drawings of investigation tunnel for the powerhouse.
2. All dimensions are in millimeters, and coordinates, chainages & elevations are in meters.
3. The excavation and support methods can be adjusted according to the actual situation after the geological conditions are revealed.
4. It is evident that the maximum unsupported span is a guideline, only, and needs continuous adjustment to the prevailing rock conditions and construction requirements at the spot.

LEGEND:

- Inferred boundary between moderately weathered and slight weathered
- Excavation line

SCALE: 1:500 0 5 10 15 20 25m

REFERENCE DRAWINGS

DCN-22-C-002	
DCN-22-C-009	
DCN-22-C-010	
UTI-HEP-DH-PC-0194	Results of Design Meeting (OE-DHI-PC) dated 4th March 2022
UTI-C-385-CVL-DC-65001	Surrounding Rock Stability Calculation of Investigation Tunnel for Powerhouse
UTI-C-845-CVL-DG-70006	LAYOUT DRAWING OF MONITORING FOR INVESTIGATION TUNNEL
0018	METHOD STATEMENT OF VENTILATION TUNNEL EXCAVATION AND SUPPORT OF PHC.
UTI-C-385-CVL-DG-65001-01	LAYOUT DRAWINGS OF INVESTIGATION TUNNEL FOR POWERHOUSE

SYMBOL AND LEGEND

FOR APPROVAL

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REV. NO.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
OE	04 Jun., 2022	RN-0053	ZHANG JI QIANG	LIU BO	LI WEI GONG WANG HUA HENG
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B	10 Oct., 2021	FOR REVIEW	ZHANG JI QIANG	LIU BO	LI WEI GONG WANG HUA HENG
A	25 MAY, 2021	FOR REVIEW	ZHANG JI QIANG	LIU BO	LI WEI GONG WANG HUA HENG

PROJECT TITLE

Upper Trishuli-1 HEP (216MW)

OWNER



OWNER'S ENGINEER



CONTRACTOR

DOOSAN Enerbility

DRAWING TITLE

EXCAVATION AND INITIAL SUPPORT DRAWINGS OF INVESTIGATION TUNNEL FOR POWERHOUSE (1/4)

INDEX	DRAWING NUMBER	SHEET NO.	REV. NO.
A	UT1-C-385-CVL-DG-65002	1 OF 4	0E

TUNNEL SUPPORT PATTERN

Rock mass quality	40≥Q	10≤Q<40	4≤Q<10	1≤Q<4		Q<1
Q value of rock mass quality for calculation	40	25	7	2.5		0.5
Support type	I	II	III	IV (Without steel support)	IV (With steel support)	V Same as type IV (With steel support)
Inner dimension(m)	W=4.2m, H=5.8m					
Excavation Parameter						
ESR	1.3	1.3	1.3	1.3		1.3
Excavation span(m)	3	3	2	1.5		0.5~1
Calculated MUS*(m)	11	9	5	3		1
MUS* for shotcrete application(m)		9	2	1.5		1
MUS* for rock dowel installation(m)		6	4	3.0		0.5~1
MUS* for steel support installation(m)						0.5~1
Excavation method	Blasting			Blasting/mechanically		Mechanically
Initial support parameters						
Weep hole, Φ50mm,L=0.3m	where necessary					
Plastic fiber shotcrete,f'c=25MPa	Spot	T=50mm	T=75mm	T=120mm	T=160mm	For class V rock, the same support scheme as class IV rock can be adopted after grouting is used to improve the integrity and firmness of surrounding rock.
Rock dowel, D25,L=3m,alternately	Spot	@2.5m×2.5m	@2m×2m	@1.5m×1.5m	@1m×1m	
Steel support, MB150 (or lattice girder)					@1m	
Forepoling grouted dowel,D25mm, @400mm, L=6m					where necessary	
*MUS. Maximum Unsupported Span.						

For class V rock, the same support scheme as class IV rock can be adopted after grouting is used to improve the integrity and firmness of surrounding rock.

Technical drawing of a tunnel entrance section, showing structural details and dimensions. The drawing includes the following elements:

- Original ground line**: Indicated by a dashed line at the top.
- plastic fiber shotcrete thickness 100mm**: Labeled on the left side of the structure.
- Rev.0E**: Revision mark at the top left and top right of the structure.
- EL 950.200**: Elevation mark on the left side.
- EL 944.200**: Elevation mark on the left side.
- VTI**: Verticality mark on the left side.
- Rockdowel, D25 @ 1.5m, L=3m**: Labeled in the center of the structure.
- Lock dowel D25, L=5m**: Labeled at the top right and bottom right of the structure.
- Weep hole, L=0.3m (where necessary)**: Labeled at the top right of the structure.
- Plastic fiber shotcrete**:
 - t=100mm for rock class IV
 - t=160mm for rock class V
- Steel support or lattice girder if necessary**: Labeled at the bottom of the structure.
- Dimensions**:
 - 500 (vertical dimension on the left)
 - 160 (vertical dimension on the right)
 - 400 (vertical dimension on the right)
 - 5600 (vertical dimension on the right)
 - 200 (horizontal dimension at the bottom right)
- Section Labels**:
 - A**: Section line A-A at the top left.
 - B**: Section line B-B at the top right and bottom right.
 - C**: Section line C-C at the top left.
- CH 0+006.000 (Field adjustable)**: Chainage mark on the right side.
- CH 0+008.000**: Chainage mark on the right side.
- tunnel entrance section**: Labeled at the bottom center.
- (the Length are subjected to geological condition)**: Note at the bottom center.

1:20

Invert concrete
 $f_c = 24 \text{ MPa}$

Wire mesh
 $(\Phi 5.5 \times 150 \times 150)$

≥ 200

-
- Figure 1.1 shows two scale bars. The top bar is for a scale of 1:100, with markings at 0, 1, 2, 3, 4, and 5m. The bottom bar is for a scale of 1:50, with markings at 0, 0.5, 1.0, 1.5, 2.0, and 2.5m.

DCN-22-C-002	
DCN-22-C-009	
DCN-22-C-010	
UTI-HEP-DHI-PC-0194	Results of Design Meeting (OE-DHI-PC) dated 4th March 2022
UTI-C-385-CVL-DG-65001	Surrounding Rock Stability Calculation of Investigation Tunnel for Powerhouse
UTI-C-845-CVL-DG-70006	LAYOUT DRAWING OF MONITORING FOR INVESTIGATION TUNNEL
0018	METHOD STATEMENT OF VENTILATION TUNNEL EXCAVATION AND SUPPORT OF PHC
UTI-C-385-CVL-DG-650001-01	LAYOUT DRAWINGS OF INVESTIGATION TUNNEL FOR POWERHOUSE

INDEX	DRAWING NUMBER	SHEET NO.	REV. NO.
A	UT1-C-385-CVL-DG-65002-02	2 OF 4	0E

Figure 1 is a cross-sectional diagram of a tunnel structure. The tunnel has a semi-circular shape with a total width of 5000 mm and a height of 6000 mm. The concrete lining has a thickness of 100 mm and a compressive strength of $f_c = 24 \text{ MPa}$. The shotcrete layer has a thickness of 100 mm. The reinforcement includes lock dowels (D25mm, L=5m) and plastic fiber shotcrete (thickness 100mm). The tunnel is supported by a steel support or lattice girder if necessary. The diagram also shows the centerline of the tunnel and the elevation of the tunnel (El. 944.200).

Rockdowel, staggered
D25mm, @1.5m x 1.5m
L=3m, 50mm out of rock
(The space is based on rock class IV,
and it is adjustable depending on the rock class)

Consolidation & backfill grouting
(where necessary)

of tunnel

200
160
2500
R2500
R2660
3700
400
0.5%

Rock dowel (D25, L=3m)
(where necessary)

0°~10.00°

A-Line
B-Line

Plastic fiber shotcrete
t=100mm for rock class IV
t=160mm for rock class V

Drainage trench
200mmx150mm

Rock dowel (D25, L=3m)
(where necessary)

0°~10.00°

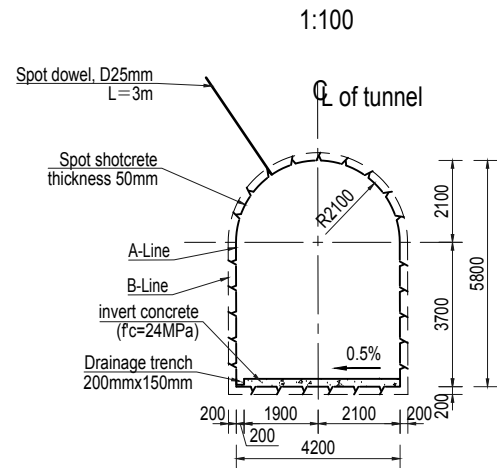
Concrete lining contour

200 200 2300 2500 200
160 160

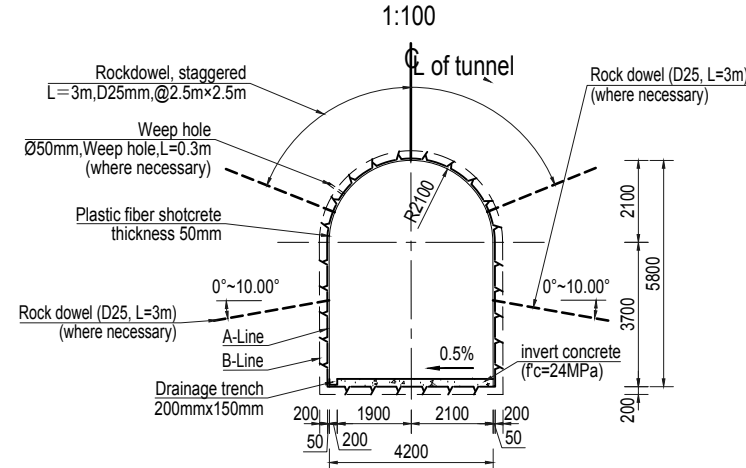
Rev.0E

NOTE: This drawing....in the execution stage, with written approval of the OE.

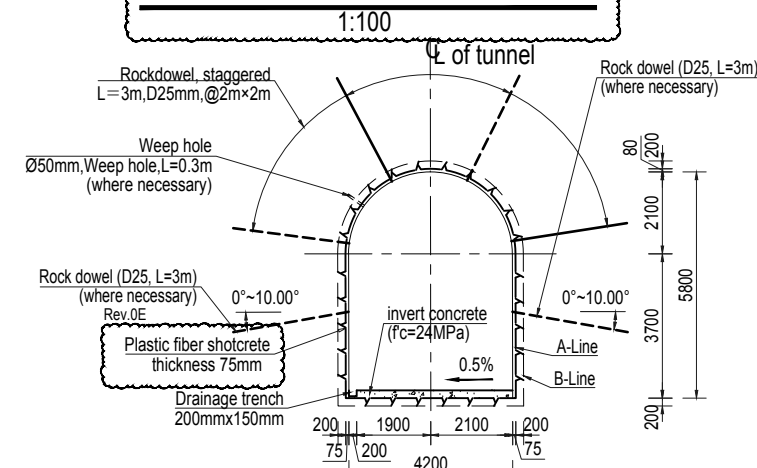
SUPPORT TYPE OF ROCK CLASS I



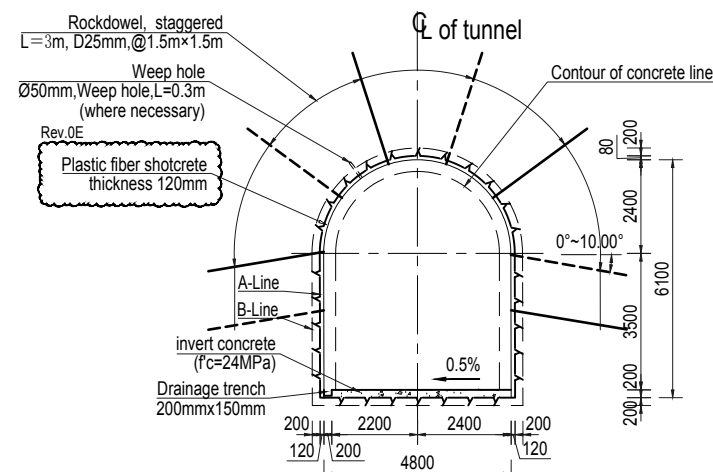
SUPPORT TYPE OF ROCK CLASS II



SUPPORT TYPE OF ROCK CLASS III

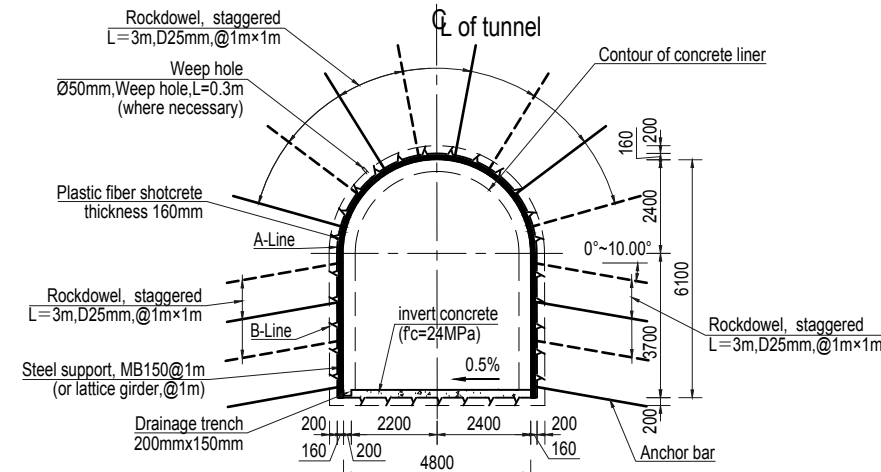


SUPPORT TYPE OF ROCK CLASS IV (Without steel support)

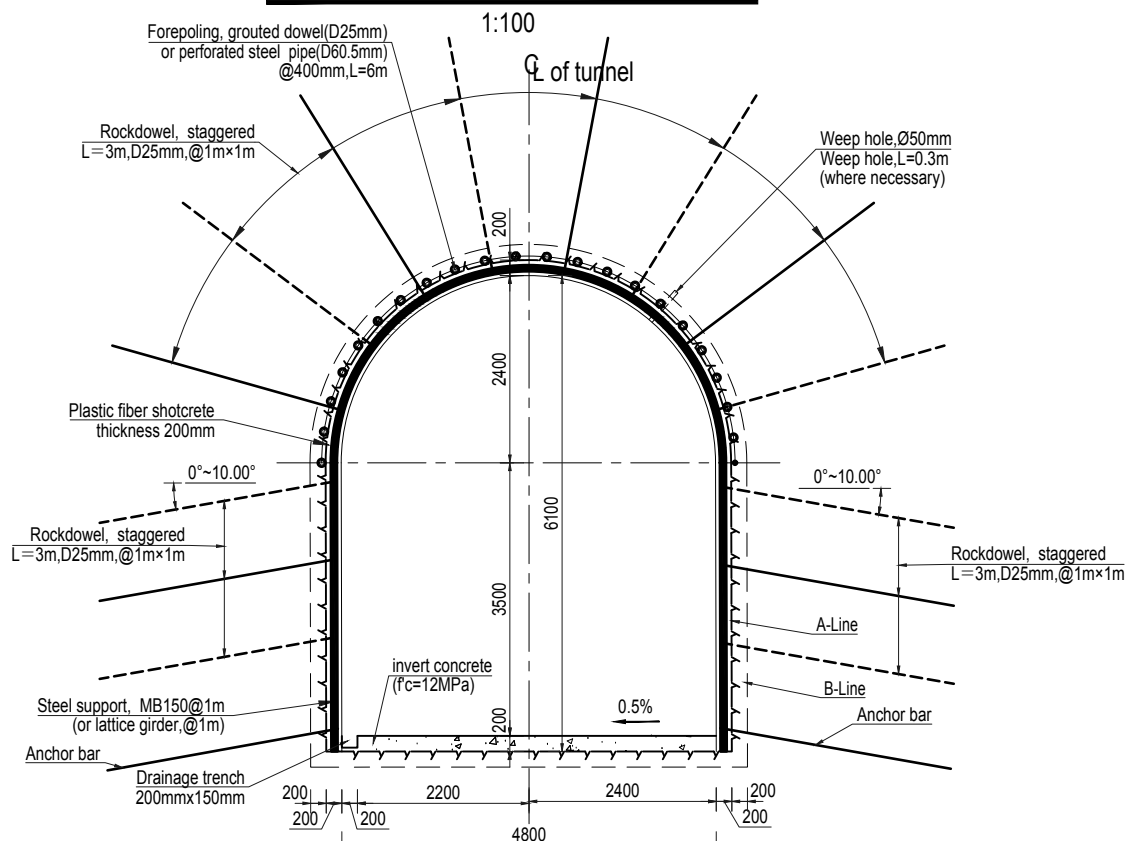


Note: If steel support is required in rock class IV, the outline of tunnel will be adjusted and consistent with the tunnel geometry of rock class V.

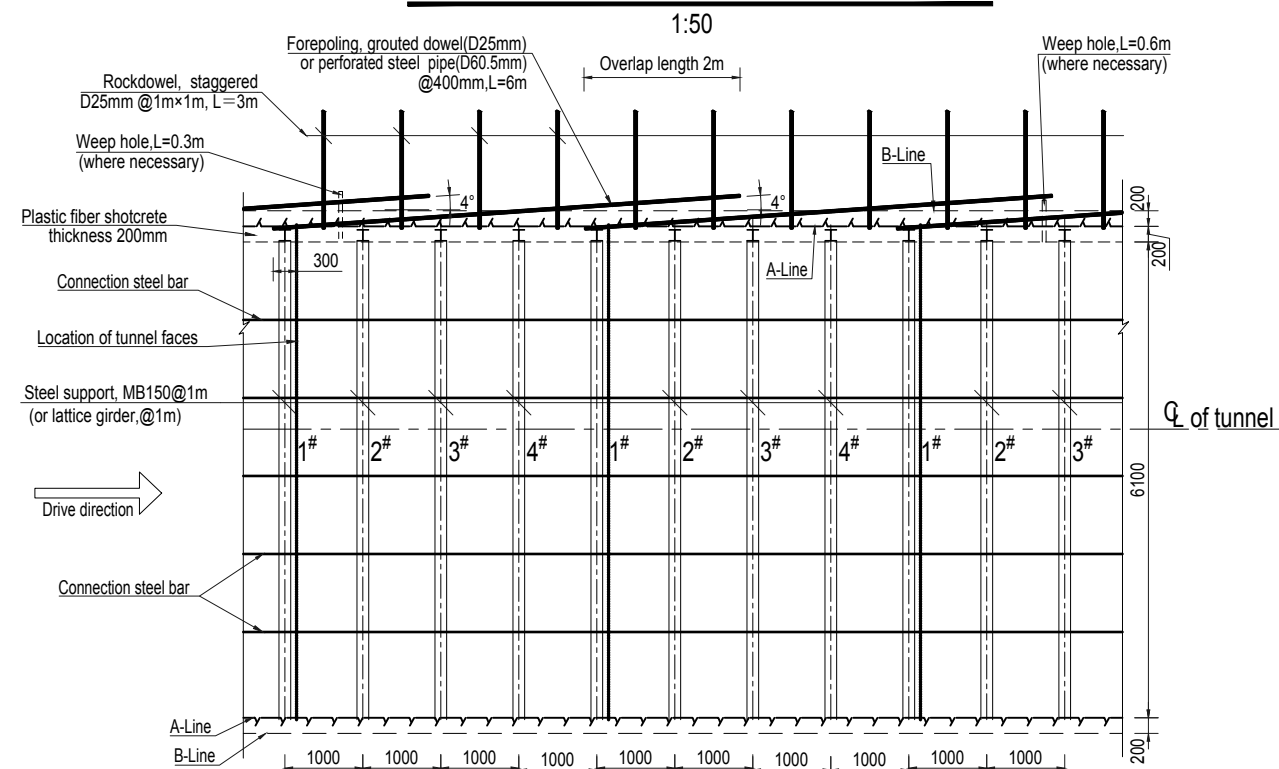
SUPPORT TYPE OF ROCK CLASS IV (With steel support)



ACROSS SECTION OF FOREPOLING



LONGITUDINAL PROFILE OF FOREPOLING

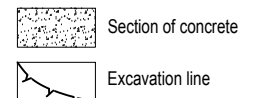


NOTE: (1)The gaps behind the steel ribs need always be filled with shotcrete and/or concrete, not with rock blocks.
(2)The excavation profile may need to be adjusted to a "saw-tooth profile" and size of ribs/girders may also be adjusted.

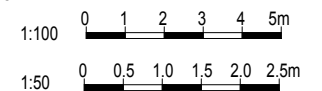
NOTE

- This set of drawings are the excavation and initial support of investigation tunnel for powerhouse.
- The forepoling is mainly used in the tunnel section with poor surrounding rock geology, which should be used together with dowel and steel support (or lattice girder), and the spacing of dowel should be consistent with that of steel support.
- The detail of weep holes, rock dowel, steel support and steel lattice girder see the drawing No. UT1-C-000-CVL-DG-40001.
- Other see sheet 2.

LEGEND:



SCALE:



REFERENCE DRAWINGS

DN-22-C-002	
DN-22-C-009	
DN-22-C-010	
UT1-HEP-DH-PC-0194	Results of Design Meeting (OE-DH-PC) dated 4th March, 2022
UT1-C-385-CVL-DG-65001	Surrounding Rock Stability Calculation of Investigation Tunnel for Powerhouse
UT1-C-845-CVL-DG-70006	LAYOUT DRAWING OF MONITORING FOR INVESTIGATION TUNNEL
0018	METHOD STATEMENT OF VENTILATION TUNNEL EXCAVATION AND SUPPORT OF PHC.
UT1-C-385-CVL-DG-65001-01	LAYOUT DRAWINGS OF INVESTIGATION TUNNEL FOR POWERHOUSE

SYMBOL AND LEGEND

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REV. NO.	DATE	DESCRIPTION	DRAWN	CHKD.	APPD.
0E	04 Jun., 2022		RN-0053	ZHANG JI QIANG	LIU BO
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A	25 MAY, 2021	FOR REVIEW	ZHANG JI QIANG	LIU BO	LI WEI GONG WANG HUA HENG

PROJECT TITLE

Upper Trishuli-1 HEP (216MW)

OWNER **NWEDC**
NEPAL WATER AND ENERGY DEVELOPMENT CO. (PVT.) LTD.

OWNER'S ENGINEER **TRACTEBEL** **ENGIE** **Jade CONSULT**

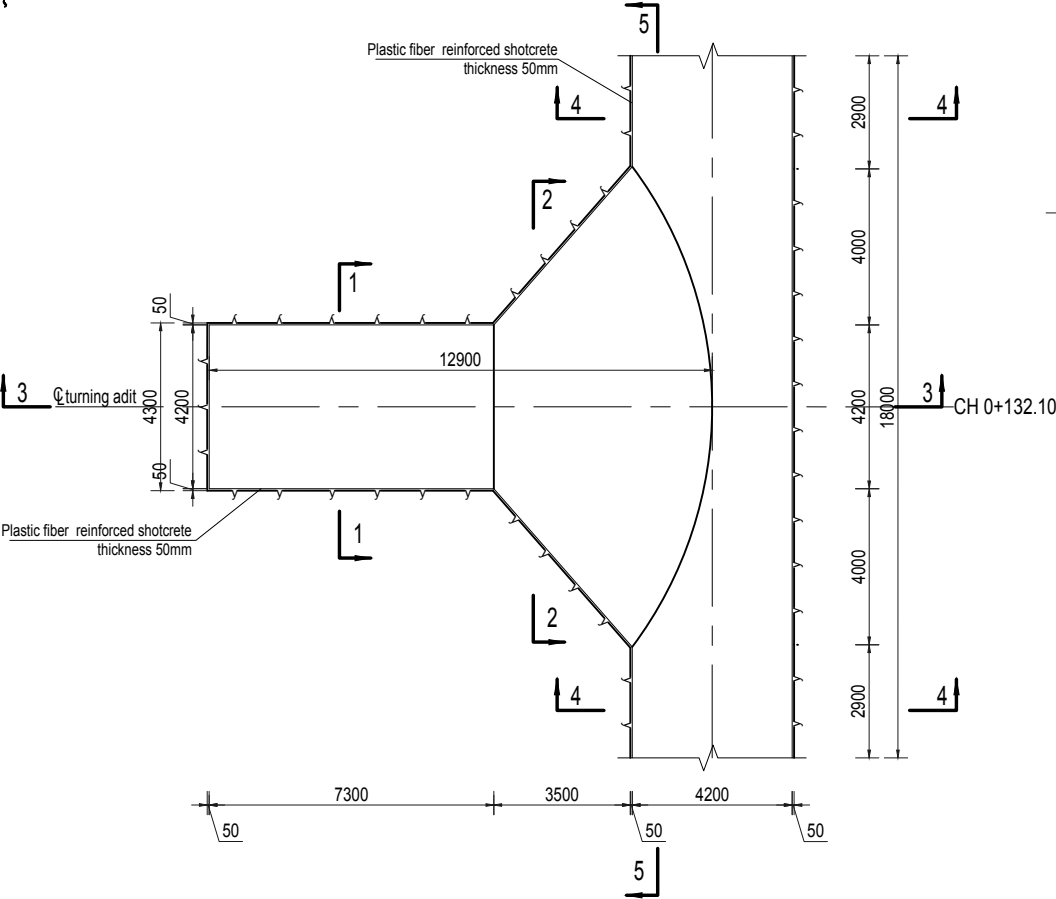
CONTRACTOR **DOOSAN Enerbility**

DRAWING TITLE
EXCAVATION AND INITIAL SUPPORT DRAWINGS
OF INVESTIGATION TUNNEL FOR POWERHOUSE (3/4)

INDEX	DRAWING NUMBER	SHEET NO.	REV. NO.
A	UT1-C-385-CVL-DG-65002	3 OF 4	0E

PLAN OF TURNING ADIT

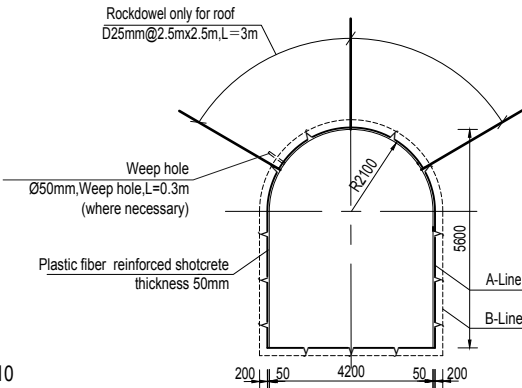
SCALE 1:100



SECTION 1-1

SCALE 1:100

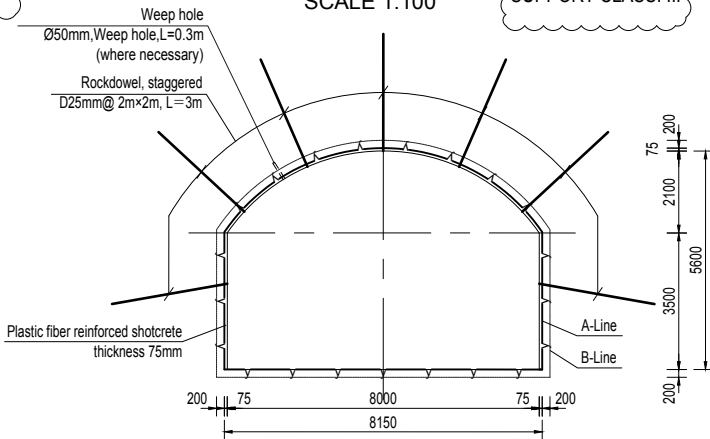
ROCK CLASS: I
SUPPORT CLASS: II



SECTION 2-2

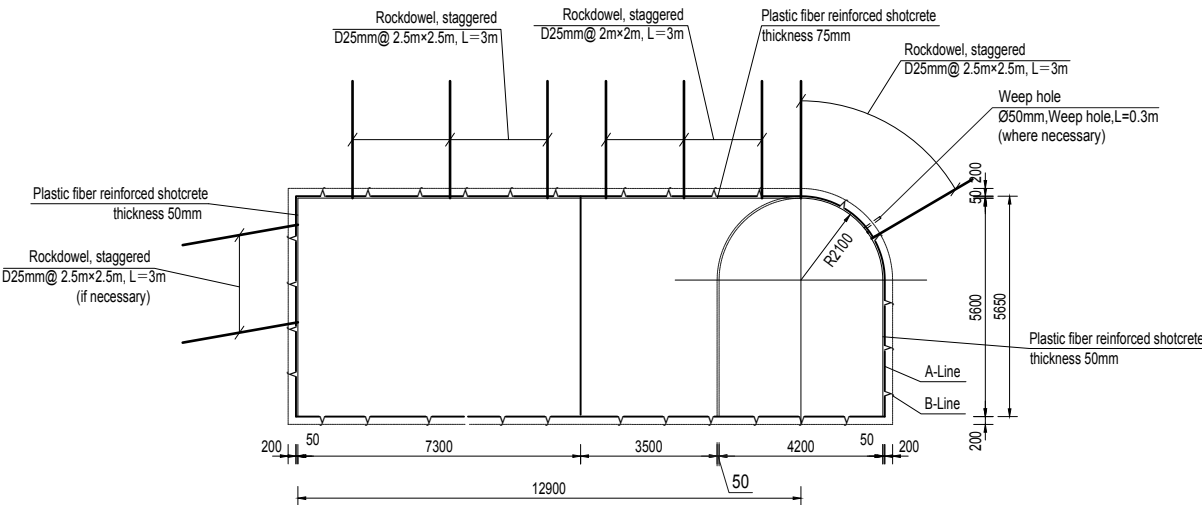
SCALE 1:100

ROCK CLASS: I
SUPPORT CLASS: III



SECTION 3-3

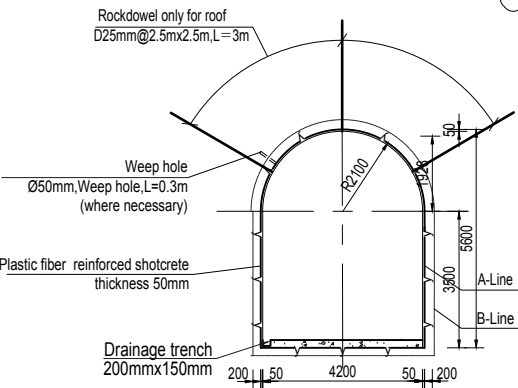
SCALE 1:100



SECTION 4-4

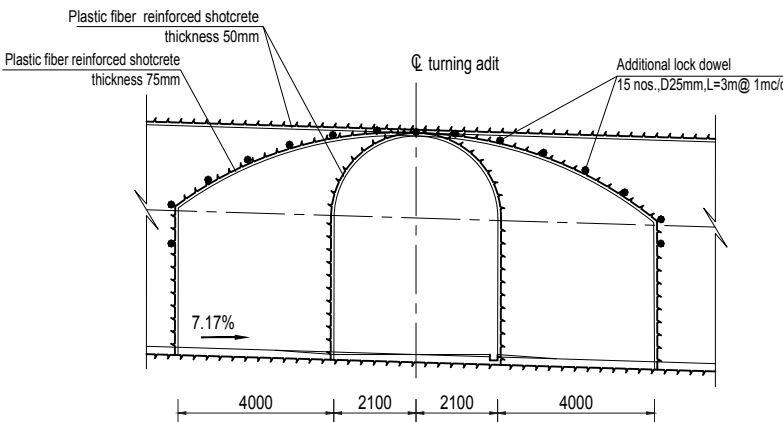
SCALE 1:100

ROCK CLASS: I
SUPPORT CLASS: II



SECTION 5-5

1:100



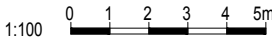
NOTE

1. This set of drawings are the excavation and support of headrace tunnel (include intake tunnel).
2. All dimensions are in millimeters, and coordinates, chainages & elevations are in meters.
4. Other see sheet 2.

LEGEND:

- Additional rockdowel
- Section of concrete
- Excavation line

Scale:



REFERENCE DRAWINGS

DN-22-C-002	
DN-22-C-009	
DN-22-C-010	
UT1-HEP-DH-PC-0194	Results of Design Meeting (OE-DH-PC) dated 4th March 2022
UT1-C-385-CV-DG-65001	Surrounding Rock Stability Calculation of Investigation Tunnel for Powerhouse
UT1-C-845-CV-DG-70006	LAYOUT DRAWING OF MONITORING FOR INVESTIGATION TUNNEL
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UT1-C-385-CV-DG-65001-01	LAYOUT DRAWINGS OF INVESTIGATION TUNNEL FOR POWERHOUSE

SYMBOL AND LEGEND

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NIPAL WATER AND ENERGY DEVELOPMENT CO. PVT. LTD.

OWNER'S ENGINEER
TRACTEBEL
ENGIE
jade CONSULT

CONTRACTOR
DOOSAN Enerbility

DRAWING TITLE
EXCAVATION AND INITIAL SUPPORT DRAWINGS OF INVESTIGATION TUNNEL FOR POWERHOUSE (4/4)

INDEX	DRAWING NUMBER	SHEET NO.	REV. NO.
A	UT1-C-150-CVL-DG-65002	4 OF 4	0E